Candidate Name	Centre Number	Candidate Number
		2

WJEC CBAC

GCE AS/A level

1071/01 **New AS**

BIOLOGY/HUMAN BIOLOGY – BY1

P.M. MONDAY, 1 June 2009

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**8**	
2	**7**	
3	**9**	
4	**9**	
5	**10**	
6	**17**	
7	**10**	
Total	**70**	

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

1. *(a)* The following table compares plant and animal cells. Complete the table by placing a tick (✓) in the appropriate box if the structure is present. Place a cross (×) in the box if the structure is not present. [2]

Structure	*Plant Cell*	*Animal Cell*
Centrioles		
Mitochondria		
Chloroplasts		

(b) (i) Draw **and label** a diagram to show a section through a typical mitochondrion. [3]

(ii) What is the function of mitochondria in cells? [1]

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(iii) Name a type of cell in which you would expect to find large numbers of mitochondria. [1]

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(iv) Explain why the cell you have chosen contains large numbers of mitochondria. [1]

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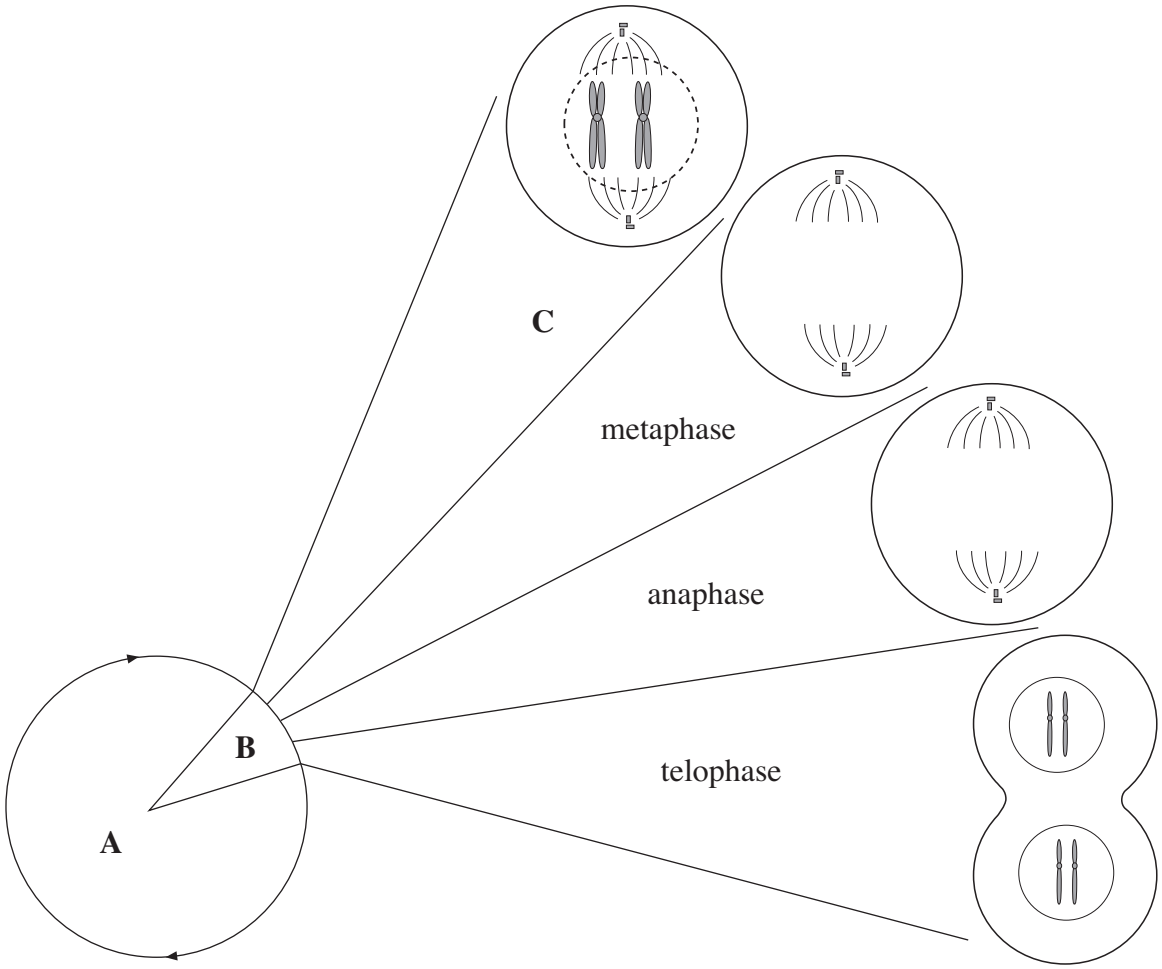
.....

(Total 8 marks)

2. The diagram shows the regular pattern of events that occur in dividing cells.



(a) Name the stages in the cycle labelled **A**, **B** and **C**. [3]

A .....

B .....

C .....

(b) Complete the drawings of the cells in metaphase and anaphase to show how the chromosomes are arranged. [2]

(c) Describe **two** processes that take place during stage **A**. [2]

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(Total 7 marks)

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3. *(a)* (i) Draw a simple **labelled** diagram to show how the three parts of a nucleotide are arranged. [3]

(ii) How do nucleotides of RNA differ from nucleotides of DNA? [2]

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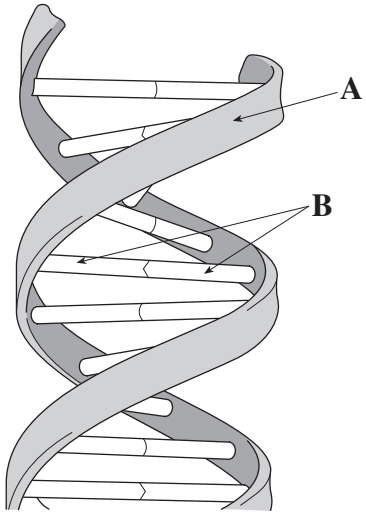
(b) The DNA molecule is a double helix. It may be described as a coiled ladder.



(i) What are the 'uprights' of the ladder, labelled **A**, made of? [1]

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(ii) The 'rungs' are made by the pairing of components labelled **B**.
Name the components in their complementary pairs. [2]

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.....

(iii) Name the type of bonds that hold the pairs together. [1]

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(Total 9 marks)

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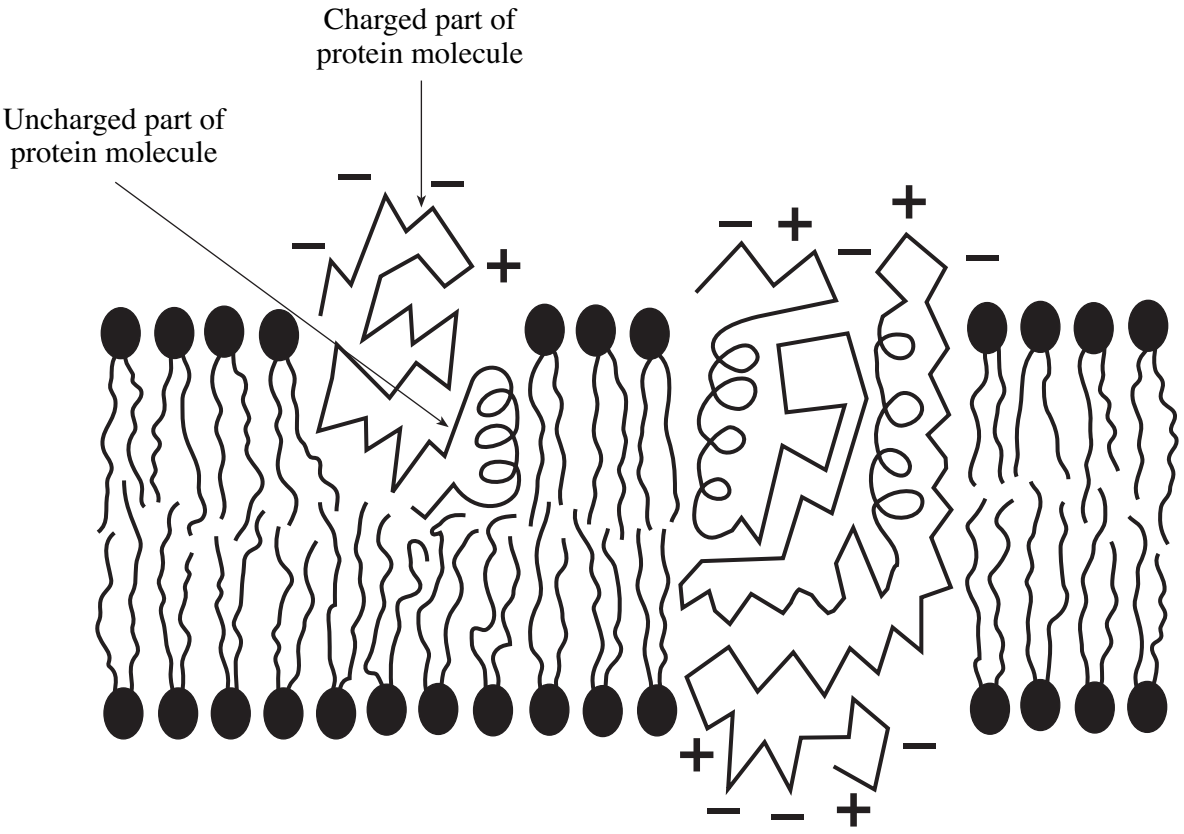
4. The diagram represents a model of a biological membrane. This model has been described as 'a phospholipid sea with protein icebergs'.



(a) (i) Name the model, proposed by Singer and Nicholson in 1972. [1]

.....

(ii) Select a single phospholipid molecule in the diagram and label the part which is hydrophilic and the part which is hydrophobic. [1]

(b) The proteins are drawn to give some indication of their tertiary structure.

Explain the difference between secondary and tertiary structure of protein molecules including reference to the type of bonds involved. [4]

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(c) (i) With reference to the diagram and your answer to part *(a)* (ii), explain how the distribution of charged and uncharged parts determine the position a protein will take up in a membrane. [2]

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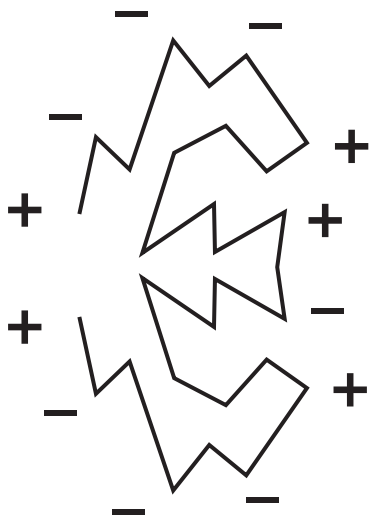
(ii) The diagram below shows another protein.



Suggest how this protein would position itself in the membrane. [1]

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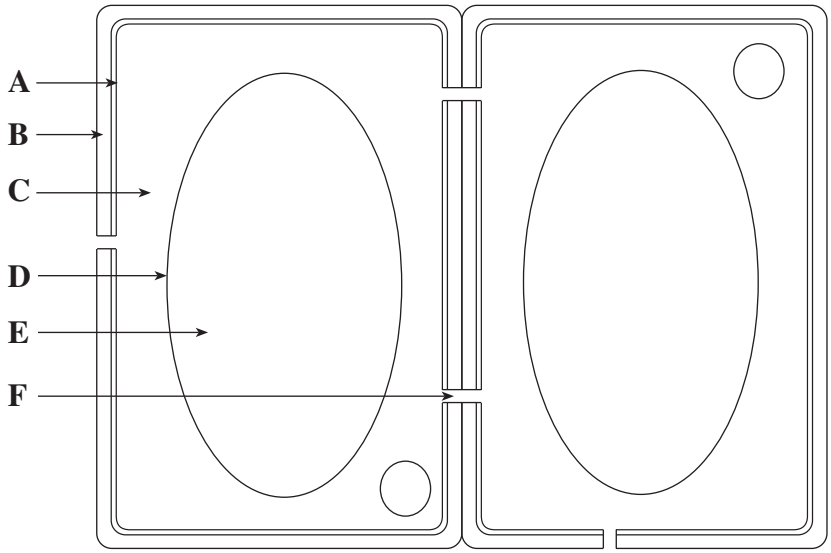
(Total 9 marks)

5. The drawings below show two adjacent plant cells, placed in a 0.6 Molar glucose solution.



(a) Name the parts labelled **A-F**. [2]

A .....

B .....

C .....

D .....

E .....

F .....

(b) Name **two** ways by which materials move between cell **X** and cell **Y**. [2]

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(c) Cells **X** and **Y** are at incipient plasmolysis, in a 0.6 molar glucose solution.
Describe **one** change, that would be visible under the microscope, if the cells were placed in a 1 Molar glucose solution. [1]

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(d) The water potential of vacuolated cells is represented by the equation:

$$\Psi_{cell} = \Psi_s + \Psi_p$$

(i) Define the term *water potential*. [1]

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.....

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(ii) Give the value of Ψ_p in cells at incipient plasmolysis. [1]

.....

(iii) Two different cells **P** and **Q** are adjacent to one another in a plant. Calculate the missing values for each cell and complete the following table. [2]

Cell	Ψ_{cell} *kPa*	Ψ_s *kPa*	Ψ_p *kPa*
P	.....	–1200	+500
Q	–300	.....	+300

(iv) In which direction will water move between these two cells? [1]

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(Total 10 marks)

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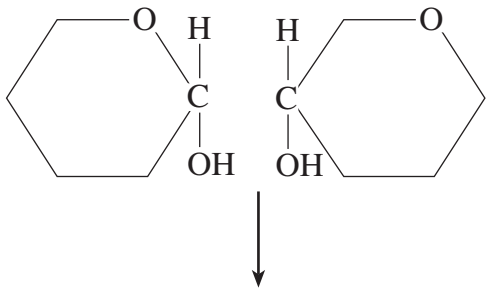
6. *(a)* (i) Complete the diagram to show the reaction between two molecules of glucose and the products formed. [3]



(ii) Name the organic molecule formed. [1]

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(iii) Name the inorganic molecule released during the reaction. [1]

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(iv) Name the type of reaction. [1]

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(Question continues overleaf)

(b) One species of bacterium *Streptococcus mutans* produces the enzyme glucosyl transferase that catalyses the polymerisation of glucose molecules. Polymers of glucose form part of the plaque on teeth which leads to dental disease.

(i) What is polymerisation? [1]

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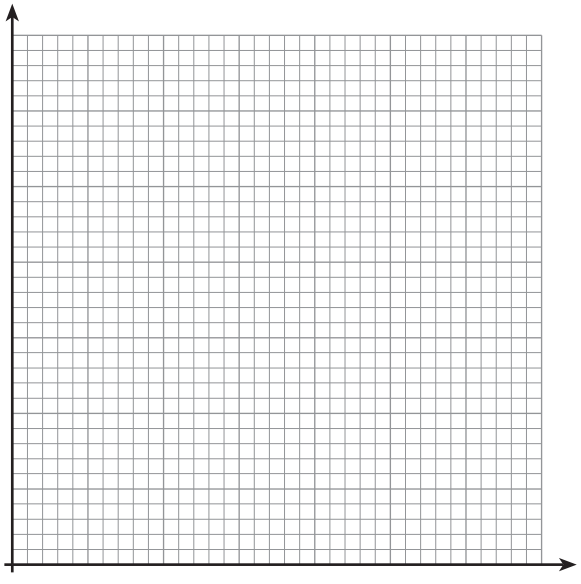
(ii) Two scientists, Devulapalle and Mooser carried out experiments using the enzyme glucosyl transferase and found that its activity was affected by the presence of iron sulphate. They published the following results.

Iron II sulphate concentration (mM)	*glucosyl transferase activity (labelled product µmoles)*
0.0	60.0
1.0	25.2
2.0	12.0
3.0	5.2
4.0	2.4
5.0	1.6
6.0	1.2

(J Dent Res 80: 466-469, 2001)

Plot the data as a suitable graph on the grid provided. [3]



(iii) Use the graph to calculate the concentration of iron sulphate that would decrease the activity of the enzyme by 50%. [1]

.....

(iv) Calculate the percentage by which a 3mM iron sulphate solution would decrease the activity of the enzyme. Show your workings. [2]

Answer .....

(v) Devulapalle and Mooser discovered that the iron sulphate acted as a competitive inhibitor. Describe the mechanism by which competitive inhibitors decrease the activity of enzymes. [3]

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(vi) Suggest a possible use for the discoveries made by Devulapalle and Mooser. [1]

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(Total 17 marks)

7. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Draw a labelled diagram to show the structure of a prokaryote cell. Explain how a typical eukaryote cell differs from a prokaryote. [10]

Or *(b)* What are immobilised enzymes? Describe the advantages of their use and how they are used in biosensors. [10]

Examiner only

Turn over.

Examiner only

(Total 10 Marks)